REMARKS

The Examiner's recognition of applicants' invention by the indication of allowable subject matter for claims 11-15 is gratefully acknowledged.

Claims 1 and 16 are amended to more particularly point out that the electrically conductive material is selected from the group consisting of bismuth, lead, lanthanum, strontium, calcium, copper, gadolinium, neodymium, yttrium, samarium, magnesium, magnesium oxide, bismuth oxide, lead oxide, lanthanum oxide, strontium oxide, calcium oxide, copper oxide, gadolinium oxide, neodymium oxide, yttrium oxide, or samarium oxide, as originally recited in claim 2, now cancelled. Claims 11 and 13 are amended to clarify the Markush group.

Objections to Claims

In response to an objection, claims 11 and 13 have been amended to clarify the Markush group. In view of the amendments, it is requested that the objection be withdrawn.

Claim Rejections based upon Haefele et al.

Claims 1-3 and 16 were rejected under 35 U.S.C. §102(b) as anticipated by United States Patent No. 4,985,126, issued to Haefele et al. in 1991. Claims 4-6 were rejected under 35 U.S.C. §103 as unpatentable over Haefele et al.

Haefele et al. describes an apparatus for monitoring gaseous components, of which

one of the gaseous components may be ammonia. Table 1 lists several materials useful in detecting ammonia, including vanadium oxide, copper oxide and cobalt oxide compounds that contain platinum. Haefele et al. also describes electrode materials that contain platinum and ruthenium, see Example 7, col. 11, line 14, and, in the Background, mentions other noble metals, col. 1, line 40. In contrast, Applicants' have found that an effective ammonia electrode is formed from oxides of vanadium, tungsten and molybdenum by reacting with bismuth, lead, lanthanum, strontium, calcium, copper, gadolinium, neodymium, yttrium, samarium, magnesium or their oxides. At most, Haefele et al. points exclusively to noble metals, and so does not point to the non-noble metals disclosed by Applicants. The rejection recognizes that Haefele et al. does not include Applicants' recited non-noble metal materials, but states that the limitation is inherent since Haefele et al. includes the vanadium oxide. However, there is nothing in the description in Haefele et al. to lead the practitioner to include Applicants' listed metals and oxides in to enhance the vanadium oxide material in sensing ammonia. Thus, Haefele et al. does not teach or suggest Applicants' invention.

Claim 1 is directed to Applicants' ammonia gas sensor that includes an electrode that is the reaction product of a main material and an electrically conductive material. The main material includes vanadium, tungsten, molybdenum and their oxides. The electrically conductive material comprises bismuth, lead, lanthanum, strontium, calcium, copper, gadolinium, neodymium, yttrium, samarium, magnesium and their oxides. Haefele et al. discloses compounds that contain no metal or noble metals and so does not point the practitioner to the recited non-noble metals. Therefore, Haefele et al. does not

teach or suggest Applicants' sensor in claim 1.

Claims 3-6 are dependent upon claim 1 and so not taught or suggested by Haefele et al. at least for the reasons set forth with regard to that claim.

Claim 16 is directed to Applicants' method that includes contacting the gas stream with a sensor formed of the reaction product of a main material and an electrically conductive material. The main material and the electrically conductive materials are the same groups recited in claim 1. Therefore, for the reasons set forth above, Haefele et al. does not teach or suggest Applicants' method in claim 16.

Accordingly, it is respectfully requested that the rejection of the claims based upon Haefele et al. be reconsidered and withdrawn, and that the claims be allowed.

Claim Rejections based upon Kitanoya et al. with Williams or Peschke et al.

Claims 1, 2, 4-10 and 16 were rejected under 35 U.S.C. § 103 as unpatentable over United States Patent Application Publication No. US2003/0062264, by Kitanoya et al., in view of PCT Publication WO 00/17106 by Williams or PCT Publication WO 95/09361 by Peschke et al.

Kitanoya et al. describes an ammonia gas sensor that includes a detecting electrode formed of Pt, Au, etc., and a metal oxide such as zirconia, alumina, and titania, see paragraph 0033. As recognized in the rejection, Kitanoya et al. does not disclose an electrode formed of the main materials or electrically conductive materials from

Applicants' lists. Rather, the rejection relies upon Williams and Peschke et al. to make up the deficiency.

Applicants' invention relates to a sensor that includes an ammonia selective sensing electrode and a reference electrode in contact with an electrolyte. During operation, oxygen ions are created by at the reference electrode and diffuse through the electrolyte to the sensing electrode. The material at the sensing electrode catalyzes a reaction between the oxygen ions and the ammonia, which reaction results in current that is the basis for determining the ammonia concentration. Kitanoya et al. also describes a sensor that is based upon oxygen ion conductivity. Referring to Fig. 1, the sensor comprises a detecting electrode 40 and a reference electrode 20 on opposite surfaces of a solid electrolyte body having oxygen ion conductivity, see paragraph 0029. In this regard, the sensor in Kitanoya et al. is similar in type to Applicants' sensor, although as discussed above, Kitanoya et al. does not disclose Applicants' materials that are effective to catalyze the ammonia reactions.

In contrast, both Williams and Peschke et al. describe solid state sensors that are based upon changes in the electrical resistance of a material when exposed to ammonia. During operation, when current is passed through the material, the interaction of electrons and ammonia at the surface changes the resistivity of the material. It is significant that the surface interaction is reversible and does not oxidize the ammonia, whereas an electrochemical sensor such as in Applicants' invention seeks a material to produce oxidation of the ammonia. Thus, the practitioner aware of the solid state sensor is not

lead to use the same material in an electrochemical sensor that requires diffusion of the oxygen ions and catlayzed oxidation reactions.

In addition, Williams describes solid state sensors based upon the compound $(MWO_4)_x(ZO_2)_{1-x}$. M may be Mg, Mn, Fe, Co, Ni, Cu, or Zn. It is significant that Applicants' list of electrically conductive materials for sensing electrode includes only two of the Williams' metals, Mg and Cu. This underscores the lack of interchangeability and predictability of the materials in the different types of reactions. Peschke et al. describes solid state sensors based upon vanadium oxide and aluminum or iron, but does not disclose the metals on Applicants' list. Thus, except for the partial overlap with Williams, the references do not point to the compositions disclosed by Applicants. Moreover, the skilled practitioner, aware of the differences in the two types of sensors, is not lead to substitute the materials in Williams or Peschke et al. to perform the electrochemical reactions needed in the electrochemical sensor, such as in Kitanoya et al. Accordingly, the references cannot be fairly read as pointing obviously to Applicants' invention.

Claim 1 is directed to Applicants' ammonia gas sensor that includes an ammonia selective electrode that is a reaction product of a listed main material and a listed electrical conducting material. The compositions in Kitanoya et al. and Peschke are readily distinguished from the materials listed in the claim, as are also most of the compositions in Williams. To the extent that there is overlap with Williams, the practitioner is not lead to substitute the materials, in view of the different types of

reactions involved. Thus, the references do not lead the practitioner to Applicants' sensor in claim 1, or in claims 4-10 dependent thereon.

Claim 16 calls for a sensing electrode like claim 1 and so is not shown by the references for the reasons above.

Accordingly, it is respectfully requested that the rejection of the claims based upon Kitanoya et al. with Williams and Peschke et al. be reconsidered and withdrawn, and that the claims be allowed.

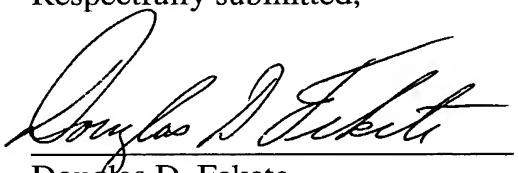
Conclusion

Claims 11-12 were objected to as dependent upon a rejected base claim. In view of the amendments and remarks herein, it is believed that the base claim is now allowable. Accordingly, it is requested that the objection be withdrawn, and that all claims be allowed.

If it would further prosecution of the application, the Examiner is urged to contact the undersigned at the phone number provided.

The Commissioner is hereby authorized to charge any fees associated with this communication to Deposit Account No. 50-0831.

Respectfully submitted,



Douglas D. Fekete
Reg. No. 29,065
Delphi Technologies, Inc.
Legal Staff – M/C 480-410-202
P.O. Box 5052
Troy, Michigan 48007-5052

(248) 813-1210